

## What Determines the Speed of Adjustment to the Target Capital Structure?

Wolfgang Drobetz  
Gabrielle Wanzenried

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Universität Bern  
Volkswirtschaftliches Institut  
Gesellschaftstrasse 49  
3012 Bern, Switzerland  
Tel: 41 (0)31 631 45 06  
Web: [www.vwi.unibe.ch](http://www.vwi.unibe.ch)

# What Determines the Speed of Adjustment to the Target Capital Structure?

Wolfgang Drobetz<sup>1</sup> and Gabrielle Wanzenried<sup>2,3</sup>

## Abstract

We use a dynamic adjustment model and panel methodology to investigate the determinants of a time-varying optimal capital structure. Because firms may temporarily deviate from their optimal capital structure in the presence of adjustment costs, we also endogenize the adjustment process. In particular, we analyze the effects of firm-specific characteristics as well as macroeconomic factors on the speed of adjustment to the target leverage. Our sample comprises a panel of 90 Swiss firms over the years 1991 to 2001. We find that faster growing firms and those that are further away from their optimal capital structure adjust more readily. Our results also reveal interesting interrelations between the adjustment speed and popular business cycle variables. For example, the speed of adjustment is higher when the term spread is higher, i.e., when economic prospects are good.

**Keywords:** Capital structure, dynamic adjustment, business cycle, panel data

**JEL Classification:** G32, C23, E44

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1 Wolfgang Drobetz, Department of Corporate Finance, University of Basel, Petersgraben 51, 4003 Basel, Switzerland, Phone: +41-61-267 33 29, Mail: [wolfgang.drobetz@unibas.ch](mailto:wolfgang.drobetz@unibas.ch).

2 Gabrielle Wanzenried, Haas School of Business, University of California Berkeley and University of Bern (Department of Economics), Mail: [gabriell@haas.berkeley.edu](mailto:gabriell@haas.berkeley.edu).

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## 1. Introduction

Capital structure is arguably at the core of modern corporate finance. While Miller and Modigliani (1958) derived conditions under which capital structure is irrelevant, the subsequent theoretical literature has convincingly shown that a firm can change its value and growth rate and improve its future prospects by varying its optimal ratio between debt and equity. Unfortunately, the empirical literature, especially for European countries, could not keep up with the pace of theoretical developments for two reasons. First, reliable company data has been available only recently for European firms. In this paper we use a panel of 90 Swiss firms over the period from 1991 to 2001. Second and even more relevant, early tests of capital structure theories suffered from several shortcomings partly explainable by a lack of appropriate econometric methods. Most important, while the well-established theories explain differences in the optimal debt-equity ratio across firms, most of the empirical literature applied a static framework, where the observed debt ratio was used as a proxy for the optimal leverage of a firm. For example, Titman and Wessels (1988) for US data and Rajan and Zingales (1995) for international data found that leverage is related to firm-specific characteristics, such as profitability, investment opportunities, tangibility of assets, and earnings volatility. However, as forcefully argued by Heshmati (2001), the theory of capital structure does not propose to explain the *observed* differences in debt ratios, but rather the differences in the *optimal* debt-equity ratios across firms. Using observed debt ratios is particularly problematic if the adjustment to the optimal capital structure is costly. In the presence of adjustment costs, it might be cheaper for firms not to fully adjust to their targets even if they recognize that their existing leverage ratios are not optimal.

The standard static capital structure models cannot capture the dynamic adjustments in leverage ratios. Recent survey evidence by Graham and Harvey (2001) and Drobetz, Pensa, Wöhle (2004) among US and German/ Swiss firms, respectively, documents that managers seek a target debt-equity ratio. The main objective in setting debt policy is not to minimize a firm's weighted average cost of capital, but rather to preserve financial flexibility in the context of a pecking order theory of the capital structure. But there is also evidence that due to random events or other changes, firms may temporarily deviate from their optimal capital structure, and then only gradually work back to the opti-

imum. To account for these stylized facts, several authors used a dynamic model approach, where the observed and optimal leverage may differ due to the presence of adjustment costs. For example, Fischer, Heinkel, and Zechner (1989) study the difference between a firm's maximum and minimum debt ratios over time and attempt to identify characteristics of firms with larger swings in their capital structures. They use the observed debt ratio range of a firm as an empirical measure of the capital structure. Their results are consistent with capital structure choice in the presence of adjustment costs in a dynamic setting. In an even earlier paper Jalilvand and Harris (1984) report that a firm's financial behavior is characterized by partial adjustment to long-run financial targets. In their setup the speed of adjustment is affected by firm characteristics and, hence, is allowed to vary by company and over time. However, the long-run financial targets towards firms partially adjust are specified exogenously. Even recently, Shyam-Sunder and Myers (1999) and Fama and French (2000) use the actual historical mean debt ratio for each firm over the sample period as a proxy for the target leverage ratio.

Using Spanish data, De Miguel and Pindado (2001) present a novel methodology to capture the dynamics of capital structure decisions more appropriately. They develop a target adjustment model that allows them to explain a firm's debt in terms of its debt in the previous period and its target debt level, the latter being a function depending on popular firm characteristics, such as profitability, growth, and tangibility of assets. Most important, they endogenize the target leverage ratio, which allows them to identify the determinants of the *optimal* capital structure rather than the observed capital structure. They specify a dynamic adjustment model with predetermined variables and apply the dynamic panel estimator suggested by Arellano and Bond (1991). It must be noted that De Miguel and Pindado (2001) still estimate a constant adjustment coefficient. Interestingly, they report that Spanish firms face lower adjustment costs than US firms. Gaud, Jani, and Hoesli, and Bender (2004) and Drobetz and Fix (2005) adopt this approach for similar samples of Swiss firms.

While these papers constitute important steps towards more realistic tests of capital structure theories, they are still silent on which factors affect the adjustment process to the optimal leverage ratio. Banerjee, Heshmati, and Wihlborg (2000) were the first to simultaneously endogenize the adjustment factor and the target leverage ratio. In addi-

tion to identifying the determinants of optimal capital structure, their setup allows them to estimate the speed of adjustment towards the target capital structure and to identify the determinants of the speed of adjustment. Specifically, using US and UK data, they hypothesize that the speed of adjustment is dependent on the absolute difference from the target debt ratio, growth opportunities, and firm size. Contrary to what they expected, their results reveal that firms with higher growth opportunities adjust slower towards the optimal capital structure and that larger firms adjust to changes in capital structure more readily. However, they do not find a significant relationship between the likelihood of adjustment and the absolute difference between optimal leverage in time  $t$  and observed leverage at the end of the previous period  $t-1$ .<sup>4</sup> In a related paper, Lööf (2003) compares the dynamics of capital structure adjustments across the two archetypes of financial systems, the US and UK arm's length system (mostly market-based system) and the Swedish relation-based system (mostly bank-based system). His results show that although firms are frequently not at their target level, the deviation is smaller for the highly equity dependent US firms. In addition, these firms adjust faster towards the optimal capital structure compared to the debt dependent Swedish companies. Using similar variables to model the speed of adjustment as Banerjee, Heshmati, and Wihlborg (2000), he finds that the estimate for the distance variable is significantly negative for UK firms, indicating that it is less costly to adjust by relatively small amounts.

Economic intuition suggests that the position of the economy in the business cycle phase should be an important determinant of default risk and, hence, of financing decisions. It is therefore an interesting research question to analyze the impact of macroeconomic factors on the speed of adjustment to the optimal capital structure. Lacking well-defined empirical predictions, previous studies included a set of time dummies to capture these effects. Recently, Hackbarth, Miao, and Morellec (2004) develop a contingent claims model in which a firm's cash flows depend on both an idiosyncratic shock and an aggregate shock that reflects the state of the economy (e.g., boom or recession). Their model delivers state-dependent shareholders' default policies, which in turn have interesting implications for optimal leverage. First, the model predicts that leverage is counter-cyclical. Second, macroeconomic conditions determine both the pace and the

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4 See Heshmati (2001) for similar results using a sample of Swedish micro and small firms.

size of capital structure changes. Allowing a firm to adjust its capital structure dynamically, the restructuring threshold is lower in good states than in bad states. Therefore, firms should adjust their capital structure more often and by smaller amounts in booms than in recessions. The empirical results by Korajczyk and Levy (2003) support some of these predictions. Looking at a 50 years history of the US aggregate non-financial corporate debt to asset ratio, they show that target leverage is counter-cyclical, i.e., there is a negative relation between macroeconomic variables and leverage. Note that this is consistent with a pecking order theory of the capital structure, but inconsistent with a trade-off theory. In a theoretical model, Levy (2001) shows that levered managers' wealth is reduced relative to outside shareholders in recessions, which exacerbates the agency problem. In order to realign managers' incentives with those of shareholders the optimal amount of debt increases, which implies counter-cyclical leverage particularly for those firms that are not severely constrained. Korajczyk and Levy (2003) further demonstrate that macroeconomic conditions are important for issue choice. Firms tend to time their issue choice to periods of favorable macroeconomic conditions, i.e., periods when the relative pricing of the security issued is favorable.<sup>5</sup> Most important, firms issue equity when the stock market experienced large run-ups and when economic prospects are good, as indicated by popular business cycle variables (e.g., the term spread and the default spread). However, the findings are not uniform across the entire sample. Financially constrained firms exhibit a pro-cyclical target leverage ratio, and their issue choice is less sensitive to variations in macroeconomic conditions than unconstrained firms. Intuitively, financially constrained firms are not able to time issues.

We investigate the adjustment process to the target capital structure using a sample of 90 Swiss firms over the years 1991-2001 period. In particular, we analyze the effects of firm-specific characteristics as well as macroeconomic factors on the speed of adjustment to the target leverage. We find that faster growing firms and those that are further away from their optimal capital structure adjust more readily. We also demonstrate that the speed of adjustment is dependent on the stage of the business cycle. Using popular business cycle variables, our results reveal that the speed of adjustment to the target is

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<sup>5</sup> Baker and Wurgler (2002) also show that firms tend to raise equity when their market values are high relative to book and past market values. The resulting effects on capital structure are persistent, suggesting that capital structure is the cumulative outcome of past attempts to time the equity market.

faster when economic prospects are good. However, we cannot detect systematic differences in the adjustment speed when we distinguish between financially constrained and unconstrained firms. We hypothesize that the sensitivity of the adjustment speed to the business cycle variables is larger for financially unconstrained firms, but it may be due to the limited size of our panel data set that we cannot find evidence in this direction.

The remainder of the paper is as follows. Section 2 starts by setting up a dynamic capital structure model and describing familiar determinants of the target capital structure. We proceed with a discussion of the determinants of the speed of adjustment to the target capital structure. Both firm-specific and macroeconomic factors are used to estimate the dynamic adjustment model. Section 3 describes our panel of Swiss company data. Section 4 contains the empirical results, and section 5 concludes.

## 2 The dynamic framework

In this section we discuss the theoretical and empirical basis for our dynamic capital structure model. The theoretical setup is presented in section 2.1. We proceed by introducing the variables used to model capital structure dynamics in our empirical analysis. Section 2.2 and section 2.3 describe the variables that influence the target capital structure and the speed of adjustment, respectively.

### 2.1 A dynamic capital structure model

Based on Heshmati (2001), we consider a dynamic capital structure model. Let the optimal leverage of firm  $i$  in period  $t$ , denoted as  $LV_{it}^*$ , be a function of well-known capital structure determinants, labeled as  $X_{it}$  (see section 3.2 for a description), and write:

$$(1) \quad LV_{it}^* = \sum_j \alpha_j X_{it} .$$

Note that this dynamic setup implies that the optimal debt ratio may vary both across firms and over time. In a world without frictions, the observed leverage of firm  $i$  at time  $t$ ,  $LV_{it}$ , should be equal to the optimal leverage, i.e.,  $LV_{it} = LV_{it}^*$ . However, if adjustment is costly, firms may not fully adjust their debt ratio from the previous period to the current one. The notion of partly adjustment is usually formalized as follows:

$$(2) \quad (LV_{it} - LV_{it-1}) = d_{it} (LV_{it}^* - LV_{it-1})$$

where  $d_{it}$  is the adjustment parameter that captures the extent of desired adjustment to the optimal leverage from the previous to the current period. The existence of adjustment costs is represented by the restriction that  $|d_{it}| < 1$ , which is the condition that  $LV_{it} \rightarrow LV_{it}^*$  as  $t \rightarrow \infty$ . If  $d_{it} = 1$ , the entire adjustment is made within one period and firm leverage is at the target. If  $d_{it} < 1$ , the firm does not fully adjust from period  $t-1$  to period  $t$  due to the existence of adjustment costs. Finally, if  $d_{it} > 1$ , the firm adjusts more than would be necessary and is still not at its target debt level.<sup>6</sup> In general, therefore,  $d_{it}$  represents the speed of adjustment, with a higher value of  $d_{it}$  denoting a higher speed of adjustment.

To endogenize the speed of adjustment, we further assume that  $d_{it}$  varies over time and is itself a function of some predetermined variable, denoted as  $Z_{it}$ . Modeling a linear relationship and omitting a constant term in order to keep the model tractable, we have:

$$(3) \quad d_{it} = b_l Z_{it}.$$

Rewriting equation (2) and substituting equations (1) and (3) yields the following relationship for leverage at time  $t$ ,  $LV_{it}$ :

$$(4) \quad LV_{it} = (1 - d_{it})LV_{it-1} + d_{it}LV_{it}^* + u_{it} = (1 - b_l Z_{it})LV_{it-1} + (b_l Z_{it}) \left( \sum_j a_j X_{it} \right) + u_{it},$$

where  $u_{it}$  is the statistical error term with mean zero and constant variance. Multiplying

(4) out, we obtain equation (5), which is subject to our empirical investigation:<sup>7</sup>

$$(5) \quad LV_{it} = LV_{it-1} - b_l Z_{it} LV_{it-1} + b_l \sum_j a_j Z_{it} X_{it} + u_{it}$$

Using panel data, Banerjee, Heshmati, and Wihlborg (2000) and Lööf (2002) apply nonlinear least square to estimate the parameters in equation (5). However, this will generally lead to biased and inconsistent estimators because the error term may be cor-

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6 According to Lööf (2002), overadjustment may reflect unanticipated changes in economic conditions.

7 If a variable  $Z_{it}$  is not firm-specific, the subscript  $it$  is replaced by  $i$ .



related with the lagged variable,  $LV_{it-1}$ . To alleviate this problem, we apply the dynamic panel data estimator suggested by Arellano and Bond (1991). Specifically, equation (5) is estimated in first differences using Generalized Method of Moments, whereby the levels of all right-hand side variables lagged twice (or more) constitute valid instruments.<sup>8</sup> Moreover, using instrumental variables accounts for the problem that delays may arise between the decision to change the capital structure and its actual execution.

We test several specifications concerning the endogeneity of the explanatory variables, but only report the results of the model that assumes that all variables are endogenous. The Arellano-Bond one-step Generalized Method of Moments (GMM) estimator is used for inference on coefficients. They are adjusted for heteroscedasticity. We also report the results of a Wald-test for the joint significance of all regressor variables. Most important, it can be shown that the coefficient estimates are only consistent if there is no second order serial correlation in the differenced residuals. We report a test-statistic ( $z_2$ ) for the null hypothesis of no second order serial correlation in the residuals. Because this restriction is violated in virtually all our specifications, we estimate equation (5) including the second lag of leverage,  $LV_{it-2}$ , as an additional explanatory variable. Note that the presence of this additional variable accomplishes a mere statistical requirement (i.e., to guarantee consistent parameter estimates), but we cannot provide a deeper economic interpretation. Hence, we do not model the second lag of leverage,  $LV_{it-2}$ , in the same way as the first lag  $LV_{it-1}$ , and we omit reporting the corresponding estimates.

Following the recommendation by Arellano and Bond (1991), their two-step GMM estimator is applied for inference about model specification. With respect to the validity of the instruments, we conduct a Sargan test for the null hypothesis that the overidentifying restrictions are valid. We use the second lag of all variables (in levels) as instruments. Finally, to assess the stability of our system (i.e., to guarantee convergence to a target), we check that the test statistic defined as the estimated coefficient of the lagged dependent variable,  $LV_{it-1}$ , minus the estimate of  $\mathbf{b}_l$  times the mean of  $Z_{it}$  falls into the interval  $[0,1]$ . This requirement is fulfilled in all model specifications.

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<sup>8</sup> Using first differences removes possible firm-specific effects by avoiding any correlation between unobservable firm-specific characteristics and regressor variables.

## 2.2. Determinants of the capital structure

According to Harris and Raviv (1991), the consensus is that “leverage increases with fixed assets, non-debt tax shields, investment opportunities, and firm size and decreases with volatility, advertising expenditure, the probability of bankruptcy, profitability, and uniqueness of the product.”<sup>9</sup> In our empirical analysis we focus on four of these variables: tangibility of assets (the ratio of fixed to total assets; *TANG*), firm size (*SIZE*), the market-to-book ratio (as a proxy for investment opportunities; *GROWTH*) and profitability (measured as the return on assets; *ROA*). In this section we give a brief rationale for the use of each of these determinants of capital structure in our empirical analysis.

*Tangibility (TANG)*: Previous empirical studies by Titman and Wessels (1988), Rajan and Zingales (1995) and Fama and French (2000) argue that the ratio of fixed to total assets (tangibility) is an important factor for leverage. However, the direction of influence is not a-priori clear. On the one hand, alleviating the classical bondholder-shareholder conflict (e.g., Galai and Masulis (1976) and Jensen and Meckling (1976)), with more tangible assets the creditors have an improved guarantee of repayment. Even in the worst state, firm assets retain more value in liquidation. Hence, the trade-off theory predicts a positive relationship between measures of leverage and the proportion of tangible assets.

On the other hand, managers of highly levered firms will be less able to consume excessive perquisites, since bondholders more closely monitor such firms (e.g., Grossman and Hart (1982)). In general, the monitoring costs will be higher for firms with less collateralizable assets, i.e., firms with less collateralizable assets may voluntarily choose higher debt levels to limit consumption of perquisites. This implies a negative relationship between the tangibility of assets and leverage.

*Firm size (SIZE)*: The effect of firm size on leverage is also ambiguous. On the one hand, Warner (1977) and Ang, Chua, and McConnell (1982) document that bankruptcy costs are relatively higher for smaller firms. Similarly, Titman and Wessels (1988) argue that larger firms tend to be more diversified and fail less often. Accordingly, the

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9 See Harris and Raviv (1991), p. 335.

trade-off theory predicts an inverse relationship between size and the probability of bankruptcy, i.e., a positive relationship between size and leverage. If diversification goes along with more stable cash flows, this prediction is also consistent with the free cash flow theory by Jensen (1986) and Easterbrook (1986). This notion implies that size has a positive impact on the supply of debt.

Alternatively, size can be regarded as a proxy for information asymmetry between firm insiders and the capital markets. Large firms are more closely observed by a large number of analysts and should be more capable of issuing informationally more sensitive equity. This leads to lower debt levels for large firms. Accordingly, the pecking order theory of the capital structure predicts a negative relationship between leverage and size, with larger firms exhibiting increasing preference for equity relative to debt.

*Growth opportunities (GROWTH):* It is generally acknowledged that the costs from issuing debt and the associated shareholder-bondholder conflicts are higher for firms with substantial growth opportunities. Thus, the trade-off model predicts that firms with more investment opportunities carry less leverage, because they have stronger incentives to signal that they do not engage in underinvestment and asset substitution. This notion is strengthened by Jensen's (1986) free cash flow theory, which predicts that firms with more investment opportunities have less need for the disciplining effect of debt payments to control free cash flows.<sup>10</sup>

Previous empirical results are mixed. For example, Titman and Wessels (1988) find a negative relationship, while Rajan and Zingales (1995) report a positive relationship between leverage and growth.<sup>11</sup> In fact, the simple version of the pecking order theory supports the latter result. Debt typically grows when investment exceeds retained earnings and falls when investment is less than retained earnings. Thus, given profitability, book leverage is predicted to be higher for firms with more investment opportunities. However, in a more complex view of the model, firms are concerned with future as well

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10 Recently, Fama and French (2000) show how the predictions for book leverage carry over to market leverage. The trade-off theory predicts a negative relationship between leverage and investment opportunities. Since the market value grows at least in proportion with investment outlays, the relation between growth opportunities and market leverage is also negative.

11 These conflicting results may be due to the fact that growth measures tend to be correlated with tangibility.

as current financing costs. Balancing current and future costs, it is possible that firms with large expected growth opportunities maintain low-risk debt capacity to avoid financing future investments with new equity offerings, or even foregoing the investments. Therefore, the more complex version of the pecking order theory predicts that firms with larger expected investments have less current leverage.

*Profitability (ROA):* In the trade-off theory, agency costs, taxes, and bankruptcy costs push more profitable firms towards higher book leverage. First, expected bankruptcy costs decline when profitability increases. Second, the deductability of corporate interest payments induces more profitable firms to finance with debt. Finally, in the agency models of Jensen and Meckling (1976), Easterbrook (1984), and Jensen (1986), higher leverage helps to control agency problems by forcing managers to pay out more of a firm's excess cash. The strong commitment to pay out a larger fraction of pre-interest earnings to creditors suggests a positive relationship between book leverage and profitability. This notion is also consistent with Ross' (1977) signaling hypothesis, where higher levels of debt can be used by managers to signal an optimistic future for the firm.

In contrast, according to the pecking order model higher earnings should result in less book leverage. Firms prefer raising capital, first from retained earnings, second from debt, and third from issuing new equity. This behavior is due to the costs associated with new equity issues in the presence of information asymmetries. Debt typically grows when investment exceeds retained earnings and fall when investment is less than retained earnings. Hence, the pecking order model predicts a negative relationship between book leverage and profitability.<sup>12</sup>

Again, previous empirical evidence is mixed. Rajan and Zingales (1995) report a negative relationship between leverage and profitability (supporting the pecking order theory), while Jensen, Solberg, and Zorn (1992) find a positive one (supporting the trade-off theory).

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12 Another question is again whether these predictions for book leverage carry over to market leverage (e.g., Fama and French (2000)). The trade-off theory predicts that leverage increases with profitability. Since the market value also increases with profitability, this positive relation does not necessarily apply for market leverage. In contrast, the pecking order theory predicts that firms with a lot of profits and few investments have little debt. Since the market value increases with profitability, the negative relationship between book leverage and profitability also holds for market leverage.

## 2.3 Determinants of the speed of adjustment to the target capital structure

### 2.3.1. Firm-specific factors

We assume that the speed of adjustment towards the optimal capital structure, denoted as  $d_{it}$ , depends on three firm-specific factors. Two of them also affect the optimal debt level (*GROWTH* and *SIZE*). The third variable measures the distance between observed and optimal leverage (*DIST*). All three variables can be interpreted as weighting the costs of changing the capital structure against the costs associated with a particular leverage level.

*Distance between observed and optimal leverage (DIST):* If fixed costs (e.g., legal fees and investment bank fees) constitute a major portion of the total cost of changing capital structure, firms with sub-optimal leverage will change their capital structure only if they are sufficiently far away from the optimal capital structure. Accordingly, the likelihood of adjustment is a positive function of the absolute difference between optimal leverage and observed leverage. We define this variable as  $DIST = |LV_{it}^* - LV_{it}|$ , where  $LV_{it}^*$  is the fitted value from the fixed-effect regression of the debt ratio of firm  $i$  on the capital structure determinants as of time  $t$ .

If fixed costs of adjustments are prohibitively high, firms will avoid approaching the capital market and use dividend policy to adjust towards optimal leverage. Intuitively, the costs of sub-optimal dividend policy are increasing with the magnitude of the absolute difference between optimal leverage and observed leverage. Hence, if firms adjust internally rather than using outside financing, there should be a negative relationship between *DIST* and the speed of adjustment. Sorting out between the two theories is an empirical matter.

*Growth opportunity (GROWTH):* Growing firms may find it easier to change their capital structure by choosing among several alternative sources of financing. A no-growth firm can only change its capital structure by swapping debt against equity, or vice versa, which may induce negative signaling effects in the presence of asymmetric information and decreases in firm value. In contrast, a growing firm can more easily change its capital structure by altering the composition of the new financing accordingly. Even under asymmetric information firm value may remain unchanged because of the positive ef-

fect of future growth opportunities. Accordingly, we expect a positive relationship between *GROWTH* and the speed of adjustment.

*Firm size (SIZE)*: If changing capital structure involves substantial fixed costs, these costs will be relatively smaller for large firms and, hence, they should more readily be able to correct deviations from the optimal capital structure. In addition, due to better analyst coverage more information is publicly available about large firms, implying better access to both debt and equity and lower anticipated costs from asymmetric information upon announcement. We therefore expect a positive relationship between *SIZE* and the speed of adjustment.

### 2.3.2. Macroeconomic factors

Banjeree, Heshmati, and Wihlborg (2000) and Lööf (2003) argue that in addition to firm-specific factors some economy-wide factors should have an impact on the speed of adjustment. They include time-dummy variables to capture these effects in a simplistic way. We apply a set of macroeconomic variables in our empirical analysis and measure their effect on adjustment speed. Specifically, we examine the hypotheses proposed by Hackbarth, Miao, and Morellec (2004) that the speed of adjustment depends on the stage of the business cycle. They argue that the speed is higher in booms than in recessions. We use popular business cycle variables, i.e., variable which are usually assumed to be related to the current and/or future state of the economy, to model time-variation in the target adjustment coefficient. The following four macroeconomic factors are assumed to impact the speed of adjustment: the term spread (*TERM*), the short-term interest rate (*ISHORT*), the default spread (*DEF*), and the TED spread (*TED*).

*Term spread (TERM) and short-term interest rate (ISHORT)*: The term spread (i.e., the slope of the term structure of interest rates) is generally assumed to be a predictor of future business cycle stages (e.g., Harvey, 1991; Estrella and Hardouvelis, 1991). It is widely acknowledged in the literature that a high (low) term spread is an indicator of good (bad) economic prospects. Consumption smoothing drives the demand for insurance or hedging, and a natural way is to substitute bonds of different maturities. If the economy is in a growth stage, but a general slowdown is expected, investors will hedge by buying assets that deliver payoffs during the future economic downturn. For exam-

ple, they could purchase long-term government bonds and simultaneously sell short-term bonds for hedging purposes. If many investors follow, the price of long term bonds increases, implying decreasing yields. In contrast, the selling pressure for short-term bonds will drive down prices and increase yields. As a result, the term structure flattens or even becomes inverted. Chen (1991) also reports that an above average term spread forecasts that the gross natural product will continue to increase over the next four to six quarters. Following the predictions in Hackbarth, Miao, and Morellec (2004), we expect faster adjustment in booms than in recessions, i.e., the coefficient on the interaction term between lagged leverage and *TERM* should be positive.

Baker and Wurgler (2002) document that the capital structure is the cumulative outcome of past attempts to time the equity market. An upward sloping term structure as an indicator of economic expansion and high expected real growth generally implies rising stock market valuation and, hence, more equity financing activities in an attempt to time exploit “windows of opportunities”. In a similar vein, survey evidence by Graham and Harvey (2001) reveals that firms issue short-term debt in an effort to time market interest rates. They borrow when they feel that short rates are low relative to long rates. At least in “normal” states low short-term rates are associated with a steep term structure of interest rates. In addition, better prospects for the real activity should lead to increasing cash flows from operations. Hence, even if firms do not approach the capital market to raise external funds, increasing profits from operations enable firms to adjust internally by changing their payout policy. This notion strengthens our hypothesis of a positive relationship between *TERM* and adjustment speed. In a similar vein, we expect a negative relationship between *ISHORT* and the speed of convergence towards the optimum.

In our empirical analysis we use the 3 month Eurodollar deposit rate for Swiss francs as the short-term interest rate. The term spread is constructed as the difference between the yield on long-term Swiss government bonds (with maturities of more than 5 years) and the 3 months Eurodollar interest rate.

*Default spread (DEF) and TED spread (TED):* The default spread (*DEF*) is calculated as the difference between the yield on US low-grade (BAA) and high-grade (AAA) corporate bonds with the same maturity. We assume that this variable is a legitimate proxy for global default risk. Specifically, it can be taken as an indicator of the current health

of the economy. Similarly, the TED spread (*TED*), defined as the difference between the 3-month Eurodollar rate and the 90-day yield on the US Treasury bill, can be viewed as a “political” risk premium that reflects either actual or anticipated barriers to international investing (e.g., Ferson and Harvey, 1993). The yield differential widens when the risk of disruption in the global financial system increases. Following our general notion, we expect a negative relationship between adjustment speed and the size of both the default spread and the TED spread.

### 3. Data

In general, our sample targets all 253 firms in the Swiss Performance Index (SPI). However, several adjustments are necessary. First, the SPI consists of a great number of financial institutions. Because banks and insurances are subject to specific rules and regulations according to Swiss law, their leverage is severely affected by exogenous factors. Following Rajan and Zingales (1995), we exclude all firms categorized as “Financials” according to the sector classification of Swiss Exchange (SWX) and focus exclusively on non-financial firms. Second, we could not collect the necessary data for many of the smaller firms in the SPI. These adjustments leave us with an unbalanced panel of 90 firms over the 1991-2001 period.<sup>13</sup> All data is taken from the Worldscope database.

Apart from the many competing theories of capital structure, there is not even a clear-cut definition of “leverage” in the academic literature. The specific choice depends on the objective of the analysis. Following Rajan and Zingales (1995), we apply two alternative definitions of leverage. The first and broadest definition of leverage is the ratio of total (nonequity) liabilities to total assets, denoted as LVLTA. This can be viewed as a proxy of what is left for shareholders in case of liquidation. Unfortunately, this measure is not without problems. First, it does not provide a good indication of whether the firm is at risk of default in the near future. Second, since total liabilities also include items like accounts payable, which are used for transaction purposes rather than for financing,

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<sup>13</sup> Drobetz and Fix (2003) look at a larger (balanced) panel of Swiss firm over the shorter period from 1997 to 2001. However, to give a better picture of the adjustment process, which is the main focus of our analysis, we use a longer, albeit smaller, sample of firms.



it is likely to overstate the amount of leverage. Finally, this measure of leverage is potentially affected by provisions and reserves, such as pension liabilities.<sup>14</sup>

An alternative, and possibly more appropriate, definition of leverage is the ratio of interest bearing debt to capital, where capital is defined as total debt plus equity, denoted as LVDC. This measure of leverage looks at the “capital employed” and, hence, best represents the effects of past financing decisions. It most directly relates to the agency problems associated with debt, as suggested by Jensen and Meckling (1976) and Myers (1977).

An additional issue is whether leverage should be computed as the ratio of the book or the market value of equity. Fama and French (2000) argue that most of the theoretical predictions apply to book leverage. Similarly, Thies and Klock (1992) suggest that book ratios better reflect management’s target debt ratios. The market value of equity is dependent on a number of factors which are out of direct control for the firm. Therefore, using market values may not reflect the underlying alterations initiated by a firm’s decision makers. In fact, corporate treasurers often explicitly claim to use book ratios to avoid “distortions” in their financial planning caused by the volatility of market prices. A similar rationale is often heard from rating agencies. From a more pragmatic point of view, the market value of debt is not readily available. Bowman (1980) documents a high correlation between market and book values of leverage. It should therefore come as no surprise that most previous literature relates to the book value of leverage. Nevertheless, we also report quasi-market leverage, where the book value of equity is replaced by the market value of equity, but value debt at its book value.

Table 1 shows the data description for our definitions of leverage over the sample period from 1991 to 2001. We report both the median and mean leverage ratios for each year as well as the cross-sectional standard deviation. There are three important observations worth mentioning. First, independent of the definition of leverage, book leverage declines. This might be explained by an attempt to increase the marginal debt capacity during the prosperous decade of the 1990s. Second, market leverage has in-

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<sup>14</sup> In Switzerland this should not be important because pension liabilities need not be expensed in the balance sheet. In contrast to most other continental European countries, pension money is managed in separated entities.

creased recently. For example, the mean ratio of debt to capital has increased from 24.80% to 31.81% between 2000 and 2001. Of course, this can be explained by the sharp decline in stock market capitalization, which strengthens our notion that market leverage is not directly under control of the firm. Finally, leverage ratios of Swiss firms are similar to the figures reported by Rajan and Zingales (1995) for US firms. For a detailed discussion and international comparison of Swiss data the interested reader is referred to Drobetz and Fix (2005).

[Insert table 1 here]

Panel A in table 2 shows the summary statistics for the determinants of the target capital structure. The exact definitions of the variables are as follows. First, *TANG* is the ratio of fixed assets to total assets in our empirical tests. The more direct approach using intangible assets in the nominator cannot be applied due to a lack of data. Second, following Titman and Wessels (1988), *SIZE* is the natural logarithm of net sales. The logarithmic transformation accounts for the conjecture that small firms are particularly affected by a size effect.<sup>15</sup> Third, *GROWTH* is measured as the ratio of book-to-market equity. Simple cash flow valuation models suggest that this is a forward looking measure. Unfortunately, we did not have research and development expenditures for most firms in our sample available. Alternatively, we could also use past growth rates of total assets. However, we think this measure is not appropriate because historical growth is not necessarily linked to future growth (e.g., Chan, Karkeski, and Lakonishok (2003)). Finally, following Titman and Wessels (1988), we use the ratio of operating income over total assets, or return on assets (*ROA*), as our profitability measure. Panel B in table 2 shows the summary statistics for the macroeconomic variables as well as the distance measure that we use as determinants of the speed of adjustment. Since the business cycle variables are well known and widely used in the literature, we omit any further discussion.

[Insert table 2 here]

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<sup>15</sup> Alternatively, one could use the natural logarithm of total assets. However, we think that net sales is a better proxy for size, because many firms attempt to keep their reported size of asset as small as possible, e.g., by using lease contracts.

## 4. Empirical Analysis

### 4.1 Determinants of target leverage

Estimation of our model in (5) crucially depends on the correct specification of the target capital structure. Therefore, in first step we run a fixed effects specification of the target leverage ratio in (1), preserving the time series variation in leverage, but ignoring most of the cross-sectional differences among firms. There is one caveat to mention, which is that leverage is sticky. A firm with higher-than-predicted leverage in one year is likely to have higher-than-predicted leverage in the next year. This stickiness in financial policy may lead to inflated t-statistics. Therefore, we add a dummy variable for each year to estimate a combined time and entity fixed effects regression model. The additional dummies control for variables that are constant across entities (firms) but evolve over time. The combined time and firm fixed effects model eliminates a possible omitted variables bias arising both from unobserved variables that are constant over time and from unobserved variables that are constant across firms. Estimation results are shown in table 3.

[Insert table 3 here]

Tangibility (*TANG*) is always positively correlated with leverage, and all coefficients are significant at the 5% level of significance. This supports the prediction of the trade-off theory that the debt-capacity increases with the proportion of tangible assets on the balance sheet. Size (*SIZE*) is positively related to leverage, indicating that size is a proxy for a low probability of default, as suggested by the trade-off theory. The estimated coefficients are again significant at the 5% level. For Germany, where firms tend to be liquidated more easily than in Anglo-Saxon countries, Rajan and Zingales (1995) report that large firms have substantially less debt than small firms. Given that Swiss company law is very similar to the German regulation, we interpret our results for Switzerland as size being a proxy for low expected costs of financial distress, and where small firms are especially wary of debt. Companies with high market-to-book ratios (*GROWTH*) tend to have lower leverage than companies with low market-to-book ratios. This result is consistent with both the trade-off theory and an extended version of the pecking order theory (e.g., Fama and French, 2002). However, the relationship is

only significant for market values of leverage. Finally, profitability (*PROF*) is negatively correlated with leverage, both for book and market leverage. This result reliably supports the predictions of the pecking order theory. All coefficients are statistically significant. Overall, the results are similar to those in Drobetz and and Fix (2003) and reveal that our capital structure variables are appropriate to model a time varying target leverage in a dynamic adjustment model.

#### 4.2. Determinants of the adjustment speed

Table 4 summarizes the impact of firm-specific factors on the adjustment speed. We are primarily interested in the coefficient on the interaction term. Note that our test equation (5) contains a negative sign on  $\beta_1$ , and the signs of the respective coefficient estimates on the interaction terms must be interpreted accordingly. Most important, in contrast to Lööf (2003) and Banerjee, Heshmati, and Wihlborg (2000) we find a positive relationship between the speed of adjustment and the distance variable (*DIST*). This result lends support to the hypothesis that the fixed costs of adjustment are significant, and firms with sub-optimal leverage will change their capital structure only if they are sufficiently far away from the optimal structure. Second, the estimated coefficient on the interaction term with growth (*GROWTH*) indicates that firms with higher growth opportunity adjust faster towards the optimal capital structure. This result confirms our hypothesis that a growing firm may find it easier to change its capital structure by altering the composition of newly raised funds. Finally, the results for the impact of firm size (*SIZE*) on the adjustment speed are mixed and do not allow further interpretation. Specifically, we cannot confirm the finding in Lööf (2003) and Banerjee, Heshmati, and Wihlborg (2000) that large firms are more concerned about capital structure decisions than small firms.

[Insert table 4 here]

Table 5 contains the results for the impact of macroeconomic factors on the adjustment speed. Consistent with our hypotheses, the estimated coefficients on the interaction terms related to *TERM* and *ISHORT* are positive and negative, respectively. Because a large term spread and a low short-term interest rate indicate that economic prospects are good, this confirms our notion that the speed of adjustment is higher in booms than in

recessions. In contrast, the positive coefficients on the interactions terms related to *DEF* and *TED* contrast with our intuition and are harder to interpret. An alternative hypothesis that is compatible with this result is that firms are forced to correct deviations from the target capital structure more readily in times of high uncertainty, i.e., they cannot afford to stay off the optimum.

[Insert table 5 here]

To further explore this issue, we refer to the observation in Korajczyk and Levy (2003) that results differ for subsamples of financially constrained and unconstrained firms. Given that a firm's access to financial markets is expected to affect its capital structure choice, and financial constraints clearly have a macroeconomic dimension, we split our sample into two categories, depending on whether a firm is financially constrained or unconstrained.<sup>16</sup> Financially constrained firms cannot postpone adjustment in either state of high or low uncertainty and cannot time issues. Accordingly, there should not be any relationship between the speed of adjustment and both the default spread and the TED spread. At least, the sensitivity of the adjustment speed to the business cycle variables should be higher for financially unconstrained firms.

Korajczyk and Levy (2003) define a firm as financially constrained if it does not have sufficient cash to undertake investment opportunities and if it faces severe agency costs when accessing financial markets. We experiment with different criteria to classify a firm as financially constrained or unconstrained. In a first approach, we use a firm's retention rate together with the existence of investment opportunities: a firm-event window is considered as financially constrained if in a given year a firm has (i) a dividend yield of zero and (ii) a Tobin's Q greater than one. All firm-events that are considered as financially constrained constitute the first subsample, and all other firm-events fall into the financially unconstrained subsample. Accordingly, each firm can be financially constrained in one year, but unconstrained in other years. This approach is similar to Korajczyk and Levy (2003). Second, instead of using both the dividend yield and Tobin's Q, we also try to define a firm-event window to be financially constrained if

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<sup>16</sup> Note that a sample split-up allows that all the coefficients in the model are different between the two subsamples, whereas a dummy variable approach usually only allows that selected coefficients are different between the subsamples.

only the dividend yield is zero. Third, instead of looking at yearly events, we also follow Fazzari, Hubbard, Petersen (1988) and define a firm as financially constrained if its dividend yield is zero during five (not necessarily consecutive) years over the 1991-2001 sample period. As a stability test, we also look at different numbers of years with zero dividend payments. Finally, we try to combine the dividend yield criteria with the requirement of having a Tobin's  $Q$  larger than one, on average, over the whole time period. Note that the last two sample split-ups classify firms as either financially constrained or unconstrained over the entire sample period.

Overall, the empirical results for the subsample tests are unsatisfactory and hardly allow meaningful interpretations. We omit reporting detailed results, because we cannot detect any systematic differences in the magnitude of the coefficients on the interaction term between constrained and unconstrained firms. In addition, the GMM estimates are inconsistent for several model specifications, as indicated by significant  $z_2$  test statistics for the null hypothesis of no second order serial correlation in the residuals. The limited size of our panel data set may be one explanation why we cannot find evidence in this direction, but more future research in this direction is clearly necessary.

## 5. Conclusions

Capital structure is a key issue for financial decision makers. Empirical evidence indicates that firms seek a target debt-equity ratio. The dependence of firms' leverage ratios on selected firm characteristics has usually been interpreted in favor of one or the other standard static capital structure models, e.g., the trade-off theory or the pecking order theory. However, these models remain completely silent on the adjustment process towards the target leverage ratio. Due to random events or other changes, firms may temporarily deviate from their optimal capital structure, and then only gradually work back to the optimum. In fact, in the presence of adjustment costs, it might be cheaper for firms not to fully adjust to their targets even if they recognize that their existing leverage ratios are not optimal. Nevertheless, there is surprisingly little empirical evidence on the determinants of a time-varying adjustment speed, and especially about the influence of macroeconomic variables on the adjustment process.

We present a simple model that endogenizes both the target leverage ratio and the speed of adjustment. Using a dynamic adjustment model and panel methodology for a sample of 90 Swiss firms over the 1991-2001 period, we are able to shed new light (i) the determinants of the *optimal* capital structure rather than the observed capital structure and (ii) the determinants of the adjustment speed. In particular, we analyze the effects of firm-specific characteristics as well as macroeconomic factors on the speed of adjustment to the target leverage. We find that faster growing firms and those that are further away from their optimal capital structure adjust more readily. Our results also reveal interesting interrelations between the adjustment speed and popular business cycle variables. Most important, the speed of adjustment is higher when the term spread is higher, i.e., when economic prospects are good.

However, our work has clear limitations. Possibly due to the small sample size we are unable to identify differences in the speed of adjustment between financially constrained and unconstrained firms. Given that a firm's access to financial markets is expected to affect its capital structure choice, and financial constraints clearly have a macroeconomic dimension, this remains an interesting open research question.

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**Table 1: Descriptive statistics of leverage**

	LVLTA						LVDC					
	<i>Book value</i>			<i>Market value</i>			<i>Book value</i>			<i>Market value</i>		
Year	Mean	Median	Std.dev.	Mean	Median	Std.dev	Mean	Median	Std.dev	Mean	Median	Std.dev
1991	61.40	60.70	15.20	58.98	61.21	18.75	43.21	42.34	18.68	41.87	40.96	20.16
1992	60.25	62.55	15.45	61.15	61.96	19.50	42.79	42.89	19.54	45.01	45.04	21.55
1993	61.54	62.27	16.12	54.74	53.01	19.93	44.32	45.51	20.98	38.86	35.29	22.28
1994	63.19	62.60	15.53	56.28	55.89	19.71	45.47	44.09	24.60	38.34	35.79	20.62
1995	60.76	61.01	15.49	54.04	54.45	19.73	45.26	41.19	45.41	35.94	33.77	21.43
1996	57.77	56.72	16.99	50.31	54.77	21.19	37.76	56.72	16.99	33.29	33.17	22.14
1997	58.32	58.08	14.71	46.18	46.32	20.10	37.43	39.47	18.71	28.65	27.49	20.36
1998	57.84	59.75	16.21	45.19	45.84	20.41	37.40	38.86	19.55	27.70	24.53	20.23
1999	57.13	59.30	16.34	41.28	42.06	19.87	36.99	37.65	18.83	25.51	23.15	19.56
2000	56.38	58.34	16.66	41.62	43.11	20.35	35.70	35.87	19.12	24.80	21.11	18.84
2001	57.85	59.80	16.22	49.03	50.32	20.77	38.66	41.06	19.19	31.81	31.34	20.41
Overall	59.17	59.63	15.99	50.16	50.90	20.97	40.21	40.43	23.59	33.14	30.46	21.50

The table reports descriptive statistics of the leverage variables over the sample period from 1991 to 2001. The sample contains an unbalanced panel of 90 Swiss firms. The debt ratios are defined as follows: LVLTA is the ratio of total (nonequity) liabilities to total assets, and LVDC is the ratio of total debt to capital, where capital is defined as total debt plus equity. For the market values of leverage the book value of equity is replaced by the market value of equity. All numbers are expressed in %.

**Table 2: Descriptive statistics of explanatory variables**

	Mean	Median	Std.dev.
Panel A: Determinants of the target capital structure			
<i>TANG</i>	0.370	0.350	0.197
<i>SIZE</i>	13.579	13.564	1.645
<i>GROWTH</i>	1.491	1.145	1.219
<i>ROA</i>	0.061	0.061	0.073
Panel B: Determinants of the adjustment speed			
<i>TERM</i>	0.006	0.009	0.012
<i>ISHORT</i>	0.036	0.029	0.023
<i>DEF</i>	0.007	0.007	0.001
<i>TED</i>	0.005	0.005	0.002
<i>DIST<sub>LVLTA_Book</sub></i>	0.138	0.103	0.130
<i>DIST<sub>LVLTA_Market</sub></i>	0.150	0.121	0.129
<i>DIST<sub>LVDC_Book</sub></i>	0.186	0.138	0.214
<i>DIST<sub>LVDC_Market</sub></i>	0.168	0.125	0.161

The table reports descriptive statistics of the explanatory variables: *TANG* is defined as the ratio of fixed assets to total assets, *SIZE* is the natural logarithm of net sales, *GROWTH* is the ratio of book-to-market equity, and *ROA* is the ratio of operating income over total assets. *DIST* is the difference between the optimal and the current debt ratio, where the optimal debt ratio is constructed as the fitted value of the fixed-effect regression of the debt ratio on the four capital structure determinants *TANG*, *SIZE*, *GROWTH*, and *ROA*. *TERM* is the term spread defined as the difference between the yield on long-term Swiss government bonds (with maturities of more than 5 years) and the 3 months Eurodollar interest rate, *ISHORT* is the 3 month Eurodollar deposit rate for Swiss francs, *DEF* is the difference between the yield on US low-grade (BAA) and high-grade (AAA) corporate bonds, and *TED* is the difference between the 3-month Eurodollar rate for US dollars and the 90-day yield on US Treasury bills.

**Table 3: Fixed effects regressions for capital structure determinants**

	LVLTA		LVDC	
	Book value	Market value	Book value	Market value
$TANG_{it}$	0.223** (0.044)	0.234** (0.043)	0.293** (0.094)	0.327** (0.052)
$SIZE_{it}$	0.042** (0.008)	0.038** (0.008)	0.043* (0.017)	0.035** (0.009)
$GROWTH_{it}$	-0.004 (0.005)	-0.030** (0.004)	0.002 (0.009)	-0.009(*) (0.005)
$ROA_{it}$	-0.254** (0.067)	-0.470** (0.065)	-0.526** (0.142)	-0.500** (0.079)
Constant	-0.035 (0.106)	0.033 (0.104)	-0.254 (0.226)	-0.161 (0.125)
R <sup>2</sup> within	0.114	0.411	0.067	0.316
R <sup>2</sup> between	0.164	0.421	0.148	0.279
R <sup>2</sup> overall	0.130	0.380	0.095	0.277
Wald test (F-stat.)	6.56** (14)	35.82** (14)	3.66** (14)	23.70** (14)
Hausmann test	11.93 (14)	35.80** (14)	3.05 (14)	13.12 (14)
Number of observations	822	822	822	822
Number of groups	90	90	90	90

The table reports the results from regressions of the leverage ratio on firm-specific capital structure determinants. *LVLTA* is the ratio of total (nonequity) liabilities to total assets, and *LVDC* is the ratio of total debt to capital, where capital is defined as total debt plus equity. For the market values of leverage the book value of equity is replaced by the market value of equity. The capital structure determinants are as follows: *TANG* is defined as the ratio of fixed assets to total assets, *SIZE* is the natural logarithm of net sales, *GROWTH* is the ratio of book-to-market equity, and *ROA* is the ratio of operating income over total assets. Fixed effects and time dummies are included. Coefficients that are significantly different from zero at the 1%, 5%, and 10% level are marked with \*\*, \*, and (\*), respectively. Robust standard errors are in brackets. Numbers in brackets for the Wald test and the Hausman test denote the degrees of freedom.

**Table 4: Firm-specific adjustment factors**

	LVLTA		LVDC	
	Book value	Market value	Book value	Market value
$LV_{it-1}$	-0.405 (0.259)	0.378 (0.758)	-5.334 (3.498)	0.828 (0.838)
$LV_{it-1} \times SIZE_{it}$	0.046* (0.021)	-0.026 (0.056)	0.422 (0.278)	-0.044 (0.061)
Wald test ( $\chi^2$ )	48.92	32.82	300.33	37.79
$z_2$	0.00	-1.25	1.23	-0.32
Sargan test	77.22	83.99	81.91	79.45
$LV_{it-1}$	0.359** (0.098)	0.505** (0.107)	0.383 (0.284)	0.805** (0.153)
$LV_{it-1} \times GROWTH_{it}$	-0.093* (0.041)	-0.334** (0.062)	-0.292 (0.212)	-0.398** (0.106)
Wald test ( $\chi^2$ )	46.55	43.28	476.52	46.64
$z_2$	-1.03	-1.17	0.52	-0.55
Sargan test	83.30	86.79	81.86	83.56
$LV_{it-1}$	0.296(*) (0.162)	0.504** (0.113)	1.046** (0.237)	0.325** (0.093)
$LV_{it-1} \times DIST_{it}$	-0.363 (0.491)	-1.271** (0.347)	-0.510** (0.140)	-0.133 (0.212)
Wald test ( $\chi^2$ )	95.48	42.20	7282.88	31.87
$z_2$	0.09	-0.37	-5.54**	-0.55
Sargan test	78.52	84.43	75.69	85.85
Number of observ.	608	592	608	593
Number of groups	90	90	90	90

The table reports the results of estimating equation (5) with the dynamic General Methods of Moments (GMM) panel data estimator proposed by Arellano and Bond (1991).  $LVLTA$  is the ratio of total (nonequity) liabilities to total assets, and  $LVDC$  is the ratio of total debt to capital, where capital is defined as total debt plus equity. For the market values of leverage the book value of equity is replaced by the market value of equity. The determinants of the speed of adjustment are as follows:  $SIZE_{it}$  is the natural logarithm of net sales;  $GROWTH_{it}$  is the ratio of book-to-market to equity, and  $DIST_{it}$  is constructed as the fitted value of the fixed-effect regression of the debt ratio on the four capital structure determinants  $TANG_{it}$ ,  $SIZE_{it}$ ,  $GROWTH_{it}$ , and  $ROA_{it}$ . The table shows the coefficients on the lagged leverage ratio and on the interaction term of the determinant of adjustment speed with the lagged debt ratio. Coefficients that are significantly different from zero at the 1%, 5%, and 10% level are marked with \*\*, \*, and (\*), respectively. Robust standard errors are in brackets. The test statistic  $z_2$  tests the null hypothesis of no second order correlation in the residuals. The Sargan test statistics for the null hypothesis that the overidentifying restrictions are valid uses the Arrelano-Bond two-step estimator.

**Table 5: Macroeconomic adjustment factors**

	LVLTA		LVDC	
	Book value	Market value	Book value	Market value
$LV_{it-1}$	0.331** (0.092)	0.124 (0.077)	0.381** (0.114)	0.296** (0.082)
$LV_{it-1} \times TERM_t$	-7.637 (5.704)	-5.415(*) (3.214)	-24.477** (7.737)	-4.322 (3.954)
Wald test ( $\chi^2$ )	53.13	43.35	633.70	54.79
$z_2$	-0.63	-3.26**	0.26	-0.42
Sargan test	65.83	75.82	71.97	71.24
$LV_{it-1}$	-0.166 (0.105)	-0.052 (0.118)	-0.979* (0.460)	-0.036 (0.128)
$LV_{it-1} \times ISHORT_t$	10.198** (2.824)	2.677 (2.595)	40.860(*) (21.444)	6.685* (3.080)
Wald test ( $\chi^2$ )	46.84	24.09	139.48	20.22
$z_2$	-0.63	-0.37	-1.13	0.27
Sargan test	69.92	74.99	70.70	75.40
$LV_{it-1}$	0.337* (0.138)	0.507** (0.156)	3.966(*) (2.395)	0.762** (0.201)
$LV_{it-1} \times DEF_t$	-19.404 (22.621)	-68.511** (22.349)	-614.464(*) (365.546)	-80.565** (27.929)
Wald test ( $\chi^2$ )	47.31	37.93	227.56	30.43
$z_2$	-0.65	-2.46*	0.50	-1.29
Sargan test	67.07	74.91	72.75	74.30
$LV_{it-1}$	0.451** (0.129)	0.149 (0.106)	-1.048 (0.830)	0.285* (0.130)
$LV_{it-1} \times TED_t$	-71.173** (24.138)	-65.359** (19.442)	100.107 (171.177)	-67.949** (26.949)
Wald test ( $\chi^2$ )	26.93	18.24	101.24	12.42
$z_2$	-1.39	-1.34	0.84	-1.33
Sargan test	50.66	49.12	51.49	50.54
Number of observ.	608	592	608	593
Number of groups	90	90	90	90

The table reports the results of estimating equation (5) with the dynamic General Methods of Moments (GMM) panel data estimator proposed by Arellano and Bond (1991).  $LVLTA$  is the ratio of total (nonequity) liabilities to total assets, and  $LVDC$  is the ratio of total debt to capital, where capital is defined as total debt plus equity. For the market values of leverage the book value of equity is replaced by the market value of equity. The determinants of the speed of adjustment are as follows:  $TERM_t$  is the term spread defined as the dif-

ference between the yield on long-term Swiss government bonds (with maturities of more than 5 years) and the 3 months Eurodollar interest rate,  $ISHORT_t$  is the 3 month Eurodollar deposit rate for Swiss francs,  $DEF_t$  is the difference between the yield on US low-grade (BAA) and high-grade (AAA) corporate bonds, and  $TED_t$  is the difference between the 3-month Eurodollar rate for US dollars and the 90-day yield on US Treasury bills. The table shows the coefficients on the lagged leverage ratio and on the interaction term of the determinant of adjustment speed with the lagged debt ratio. Coefficients that are significantly different from zero at the 1%, 5%, and 10% level are marked with \*\*, \*, and (\*), respectively. Robust standard errors are in brackets. The test statistic  $z_2$  tests the null hypothesis of no second order correlation in the residuals. The Sargan test statistics for the null hypothesis that the overidentifying restrictions are valid uses the Arrelano-Bond two-step estimator.